



March 2017

# NAVY SHIPBUILDING

## Need to Document Rationale for the Use of Fixed-Price Incentive Contracts and Study Effectiveness of Added Incentives

# GAO Highlights

Highlights of [GAO-17-211](#), a report to congressional committees

## Why GAO Did This Study

DOD encourages the use of FPI contracts because they allow for equitable sharing of costs savings and risk with the shipbuilder. Under FPI contracts, the shipbuilder's ability to earn a profit or a fee is tied to performance. After costs reach the agreed upon target cost, the shipbuilder's profit decreases in relation to the increasing costs. A ceiling price fixes the government's maximum liability.

A House Report on the Fiscal Year 2014 National Defense Authorization Act included a provision for GAO to examine the Navy's use of FPI contracts for shipbuilding. This report examines (1) the extent to which the Navy has entered into FPI contracts over the past 10 years, (2) how FPI contracts apportion risk between the Navy and the shipbuilder, and (3) the extent to which FPI contracts led to desired cost outcomes. GAO selected a non-generalizable sample of six contracts (for 40 ships) awarded during the past 10 years, analyzed Navy contract documents, and interviewed program, contract, and shipbuilding officials. This is the public version of a sensitive but unclassified report issued in November 2016.

## What GAO Recommends

For shipbuilding contract awards, the Navy should (1) document in the contract file its rationale for selecting an FPI contract and the basis for contract elements and (2) conduct a portfolio-wide assessment of its use of additional incentives on FPI contracts across its shipbuilding programs. DOD agreed with GAO's recommendations and stated that actions will be taken in 2017 to address them.

View [GAO-17-211](#). For more information, contact Michele Mackin at (202) 512-4841 or [mackinm@gao.gov](mailto:mackinm@gao.gov).

March 2017

## NAVY SHIPBUILDING

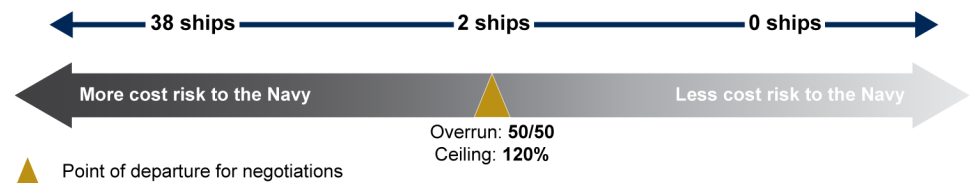
### Need to Document Rationale for the Use of Fixed-Price Incentive Contracts and Study Effectiveness of Added Incentives

## What GAO Found

Over 80 percent of the Navy's shipbuilding contracts awarded over the past 10 years were fixed-price incentive (FPI). However, GAO found that half of the six selected contracts it reviewed did not document the Navy's justification for selecting this contract type. Moreover, key documents that should describe the rationale for selecting contract elements varied across these contracts. Given the Navy's plans to invest billions of dollars in shipbuilding programs in the future, without adequate documentation on the rationale for use of an FPI contract and key decisions made about FPI contract elements, contracting officers will not have the information they need to make sound decisions at the negotiation table.

Department of Defense (DOD) regulation suggests, as a point of departure for contract negotiations, that the government and shipbuilders share the cost risk equally and set a ceiling price 20 percent higher than the negotiated target cost. GAO found that, for most of the 40 ships on the contracts reviewed, these contract terms resulted in the Navy absorbing more cost risk, as shown below.

**GAO Assessment of Share of Cost Risk between the Navy and Shipbuilder for 40 Selected Ships at Time of Contract Award Compared to Guidance and Regulation (Not to scale)**



Source: GAO analysis of Department of Defense data. | GAO-17-211

Note: Ships assessed include Arleigh Burke Class Guided Missile Destroyers (DDG 115-116), Expeditionary Mobile Bases (ESB 3-4), Expeditionary Transfer Docks (ESD 1-2), Littoral Combat Ships (LCS 5-24), San Antonio Class Amphibious Transport Dock Ships (LPD 22-27), Virginia Class Submarines (SSN 784-791).

Many factors inform the Navy's and shipbuilder's negotiation positions, including the stability of the supplier base and extent of competition. That said, guidance states that the FPI contract elements should be the primary incentive for motivating the shipbuilder to control costs. But GAO found that in five of the six contracts, the Navy added over \$700 million in incentives.

Of the 11 ships delivered as of December 2015 under the six contracts, 8 experienced cost growth. In one case, costs grew nearly 45 percent higher than the negotiated target cost. Further, it is unclear whether the additional incentives achieved intended cost and schedule outcomes, as GAO found a mixed picture among the contracts reviewed. Regulation, while not prescriptive, highlights the benefits of measuring the effectiveness of incentives. According to a senior Navy contracting official, the Navy has not measured incentive outcomes for its shipbuilding portfolio. Without assessing whether adding incentives is effective in improving shipbuilder performance, the Navy is missing an opportunity to better inform decisions about whether to include additional incentives in future awards.

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#### Abbreviations

AFSB	Afloat Forward Staging Base
DDG 51	Arleigh Burke Class Guided Missile Destroyers
DFARS	Defense Federal Acquisition Regulation Supplement
DOD	Department of Defense
EDA	Electronic Document Access
ESB	Expeditionary Mobile Base
ESD	Expeditionary Transfer Dock
FAR	Federal Acquisition Regulation
FPI	fixed-price incentive
LCS	Littoral Combat Ship
LPD 17	San Antonio Class Amphibious Transport Dock
MLP	Mobile Landing Platform
NAVSEA	Naval Sea Systems Command
RFP	request for proposal
SSN 774	Virginia Class Submarine
SUPSHIP	Supervisor of Shipbuilding, Conversion and Repair
USD (AT&L)	Under Secretary of Defense for Acquisition, Technology, and Logistics

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March 1, 2017

## Congressional Committees

The U.S. Navy builds the most sophisticated, technologically advanced ships in the world, but pays a high premium for this capability. Recent Department of Defense (DOD) initiatives have encouraged the increased use of fixed-price incentive (FPI) contracts as a way to obtain greater efficiency and productivity in defense spending. In the past 10 years, the Navy has obligated more than \$72 billion in contracts for detail design and construction. The first ship of a class, called a lead ship, is often purchased with a cost-reimbursement type contract under which the government generally bears the risk of cost, schedule, or ship performance problems. After contracting for the first few ships in a class, the Navy generally moves to an FPI contract because greater certainty about costs and performance allows for the use of this type of contract. FPI contracts provide the shipbuilder an incentive to control costs by linking final profit realized to final negotiated and actual costs. FPI contracts also mitigate the shipbuilder's cost risk in that the Navy shares in cost increases up to a specified point, and conversely any cost savings if actual final costs are less than the target cost. While FPI contracts should motivate the shipbuilder to control costs, according to our past work, cost and schedule growth remain a persistent problem in Navy shipbuilding programs.

For nearly a decade, we have encouraged the use of fixed-price type contracts for Navy shipbuilding programs. In 2007, we reported that because the Navy commonly experienced cost growth on lead and follow-on ships it could improve cost outcomes for shipbuilding programs by increasing the use of fixed-price contracts. We also noted that the use of fixed-price contracts require that technologies be demonstrated early, the design be stabilized before construction begins, and that realistic estimates for cost and schedule be made.<sup>1</sup> In 2009, we also reported on the Navy's use of contracts for detail design and ship construction, and compared it to commercial practices. We found that leading commercial shipbuilders and ship buyers exclusively employ firm-fixed-price contracts with accompanying penalties for delays. In comparison, we found that the

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<sup>1</sup>GAO, *Defense Acquisitions: Realistic Business Cases Needed to Execute Navy Shipbuilding Programs*, [GAO-07-943T](#) (Washington, D.C.: July 24, 2007).

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Navy often relied upon contract structures that left a higher level of risk with the Navy as the buyer—such as cost reimbursement and FPI contracts—often because an incomplete understanding of the effort needed to complete the ship translated into uncertainty about costs.<sup>2</sup>

A House Report on the Fiscal Year 2014 National Defense Authorization Act included a provision for us to examine the Navy's use of FPI contracts for shipbuilding programs. This report examines (1) the extent to which the Navy has entered into FPI contracts over the last 10 years and the factors that influence the Navy's contracting approach when awarding FPI contracts for ship construction, (2) how the Navy apportions risk between the government and the shipbuilder for these contracts, and (3) the extent to which use of the FPI contract type has led to desired outcomes.

To determine the Navy's use of FPI contracts over the last 10 years, we compiled and analyzed DOD data on contracts awarded for detail design and construction of new ships from November 2005 through November 2015. To gain an understanding of how the Navy determines the use of FPI contracts and implements them, we reviewed a nongeneralizable sample of six FPI contracts awarded by the Navy for new ship construction during our 10-year time frame. To select specific contracts for review to address our second and third objectives, we first selected shipbuilding programs that had at least one ship previously delivered by the shipbuilder, or would be delivered imminently and represented the majority of U.S. shipyards that build Navy vessels, including Austal USA in Mobile, Alabama; General Dynamics Bath Iron Works in Bath, Maine; General Dynamics Electric Boat in Groton, Connecticut; General Dynamics NASSCO in San Diego, California; Huntington Ingalls Industries in Pascagoula, Mississippi; and Marinette Marine Corporation in Marinette, Wisconsin. Based on the shipbuilding programs that met this criterion, we selected the following 6 Navy contracts for review, for a total of 40 ships:

- one contract with two Arleigh Burke-class guided missile destroyers (DDG 51 class),

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<sup>2</sup>GAO, *Best Practices: High Levels of Knowledge at Key Points Differentiate Commercial Shipbuilding from Navy Shipbuilding*, [GAO-09-322](#) (Washington, D.C.: May 13, 2009).

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- one contract with two expeditionary transfer dock (ESD) and two expeditionary mobile base (ESB) ships,<sup>3</sup>
  - two contracts with 10 Littoral Combat Ships (LCS) each,<sup>4</sup>
  - one contract with six San Antonio-class amphibious transport dock ships (LPD 17 class), and
  - one contract with eight Virginia-class submarines (SSN 774 class).

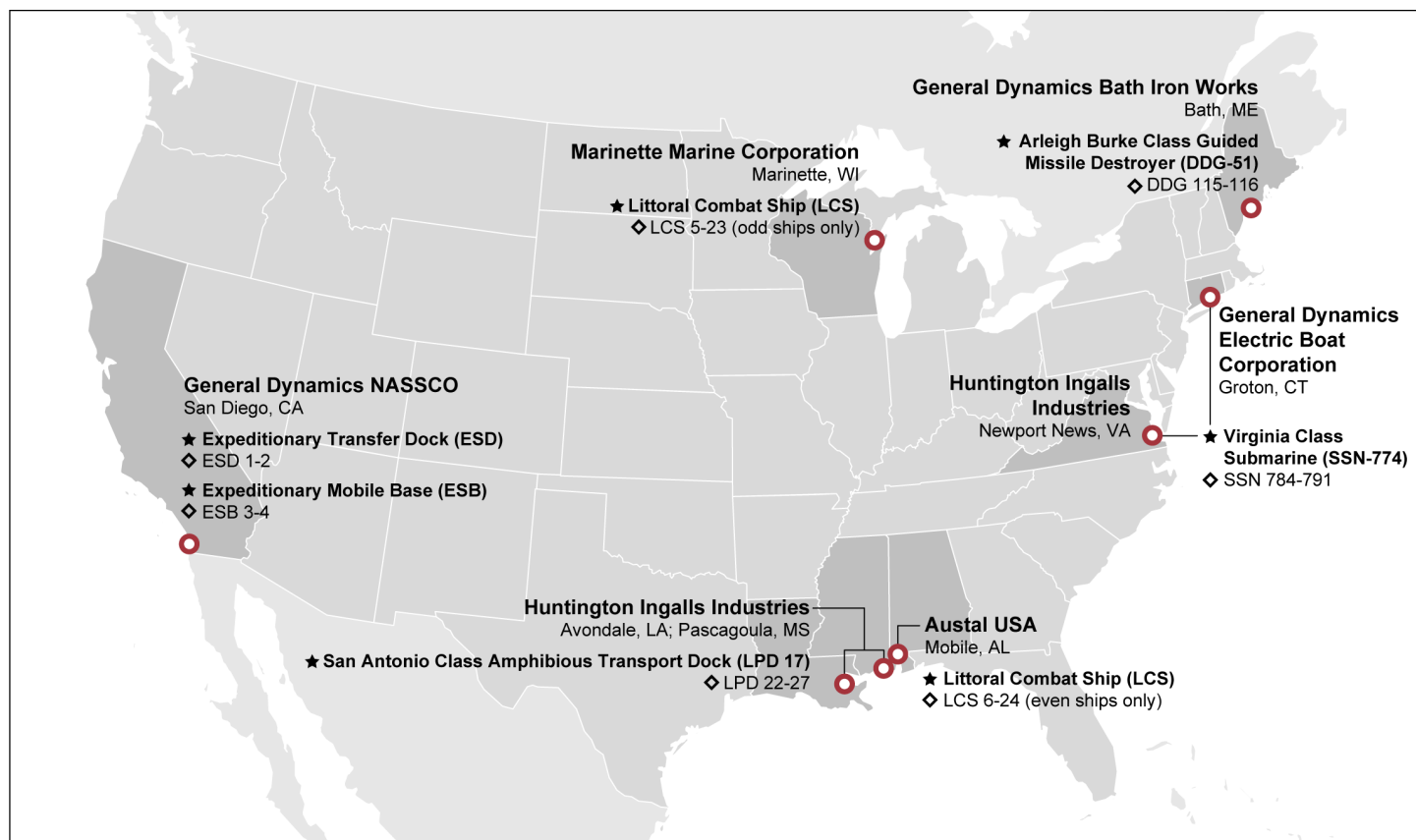
The five Navy shipbuilding programs associated with our six selected contracts cover all of the major U.S. shipbuilders. Figure 1 depicts the major U.S. shipbuilders for the specific programs we reviewed.

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<sup>3</sup>The ESD and ESB ships were originally known as the Mobile Landing Platform (MLP) and the MLP Afloat Forward Staging Base (AFSB) variant, respectively. In September 2015 the Secretary of the Navy redesignated these ships to conform to traditional three-letter ship designations. For purposes of this report we refer to the program as the ESD/ESB program.

<sup>4</sup>For the LCS contracts the Navy added a ship to each contract post-award through a contract modification for a total of 11 ships on each contract. The Navy exercised the options for construction of these ships after the cutoff date for our analysis, December 2015; therefore, the 11th ship on each contract is not in our scope.

**Figure 1: Locations of Major Navy Contractor Shipyards and Associated Product Lines for Select Contracts GAO Reviewed**



- ★ Program name
- ◇ Ships reviewed

Source: GAO analysis of Navy information. | GAO-17-211

Note: Northrop Grumman previously owned the Ingalls shipyard in Pascagoula, Mississippi and the Avondale shipyard in New Orleans, Louisiana, the primary shipyards in which LPD 17 class ships were built. In 2011, Northrop Grumman completed a spin-off of its shipbuilding operations to form Huntington Ingalls Industries. Huntington Ingalls Industries closed shipbuilding operations at Avondale in 2014.

To determine how the Navy apportioned risk between the government and shipbuilder, we reviewed contract file documentation including acquisition planning documents, requests for proposals (RFP), business clearance memorandums (key documents that explain the rationale for contract selection and structure of FPI contract elements including target cost, target profit, share line and ceiling price), the contracts, cost and schedule data, and program briefings, among other documents, and



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compared them to relevant guidance on contract selection and the use of FPI contracts.<sup>5</sup>

To determine the extent to which FPI contracts led to desired outcomes and identify changes in cost, price, and incentives through contract modifications over the life of the contract, we reviewed this information both at the time of initial contract award—including target cost, share line, ceiling price, and incentives—as well as the same updated information in the conformed version of the contract as of December 2015. We calculated the price to government for each ship, including the shipbuilder's profit or loss, by comparing the estimated cost at completion as of December 2015 to the target cost, share line, and ceiling price in the conformed version of the contract as of December 2015. We assessed the reliability of DOD's Electronic Document Access (EDA) System data by reviewing existing information about the data and comparing it with documentation in the contract files. EDA is a web-based system which provides users with access to contractual and procurement documents used by multiple DOD activities to streamline their business processes. We determined that the data were sufficiently reliable for the purpose of this report. We supplemented our review of contract file information with interviews with program and contracting officials for each shipbuilding program associated with our six selected contracts, senior contracting officials in the Naval Sea Systems Command (NAVSEA) Contracts Directorate, officials from the Navy's Supervisor of Shipbuilding, Conversion and Repair (SUPSHIP), officials from the Under Secretary of Defense (Acquisition, Technology and Logistics) Office for Defense Procurement and Acquisition Policy, and shipbuilders. Appendix I contains more detail on our objectives, scope, and methodology.

This report is a public version of a sensitive but unclassified report that we issued on November 9, 2016.<sup>6</sup> DOD regarded some of the material in that report as sensitive but unclassified information, which must be protected from public disclosure and is available for official use only. As a result, this public version of the original report does not contain certain information deemed to be sensitive but unclassified by DOD, including

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<sup>5</sup>A share line is used to determine profit earned by the shipbuilder. The Navy also refers to a share line as a profit adjustment formula or sharing ratio. We discuss share lines in more detail later in this report.

<sup>6</sup> GAO, *Navy Shipbuilding: Need to Document Rationale for the Use of Fixed-Price Incentive Contracts and Study Effectiveness of Added Incentives*, GAO-17-219SU (Washington, D.C.: Nov. 9, 2016).

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specific share lines, ceiling prices, and target costs of the Navy ships we assessed, our assessment of the relative differences in share of cost risk between the Navy and shipbuilder on the 40 ships reviewed, specific dollar amounts of added incentives on ships we assessed, and Navy and shipbuilder cost outcomes on six delivered ships with significant cost growth. This report uses data from December 2015 to be consistent with the report issued in November 2016.

We conducted this performance audit from September 2015 to March 2017 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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## Background

Navy ships are complex defense systems, using advanced designs with state-of-the-art weapons, communications, and navigation technologies and requiring many years to plan, budget, design, and build.

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## Navy Shipbuilding Contract Types

The Navy uses three primary contract types for shipbuilding programs—firm-fixed-price, FPI, and cost-reimbursement type contracts. Contract type selection is a key factor in determining risk apportionment between the Navy and the shipbuilder. According to the Director of Defense Pricing, choosing a contract type is an important way of aligning the incentives between the government and the shipbuilder. No single contract type will work for all shipbuilding programs in all cases. The following is a brief description of each contract type used in Navy shipbuilding programs:

- **Cost-Reimbursement Contracts**—the government pays the shipbuilder's allowable incurred costs to the extent specified in the contract and may include an additional fee (profit). These contracts establish an estimate of total costs and a ceiling that the contract may not exceed without the approval of the government. The shipbuilder must put forth its best efforts to perform the work within the estimated costs. However, the government must reimburse the builder for its allowable costs regardless of whether the work is completed. Generally this contract type is used when requirements are not well defined or lack of knowledge does not permit costs to be sufficiently

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estimated to use a fixed-price contract, such as in the case of designing and building lead ships.

- **Fixed-Price Incentive (FPI) Contracts**—the contract specifies several contract elements including a profit adjustment formula referred to as a share line. In accordance with the share line, the government and the shipbuilder share responsibility for cost increases, or decreases, compared to the agreed upon target cost. The final negotiated cost is subject to a ceiling price, which is the maximum that may be paid to the contractor, except for any adjustment under other contract clauses. Generally, the share line functions to decrease the shipbuilder's profit as actual costs exceed the target cost. Likewise, the shipbuilder's profit increases when actual costs are less than the target cost for the ship. Since the shipbuilder's profit is linked to actual performance, FPI contracts provide an incentive for the shipbuilder to control costs. Incentive arrangements can be designed to achieve specific objectives by motivating contractor efforts that might not otherwise be emphasized and discouraging contractor inefficiency and waste.
- **Firm-Fixed-Price Contracts**—the government agrees to purchase a ship for a set price and the shipbuilder is required to deliver a ship regardless of their actual costs. The shipbuilder bears the full responsibility for increases in the cost of construction and therefore can earn a higher profit if actual costs are below the contract price. The shipbuilder bears the maximum risk and full responsibility for all costs and resulting profit or loss. This contract type is suitable for situations where the government and shipbuilder have a clear understanding of the scope of work and are confident in the cost of ship construction.

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## Elements of Fixed-Price Incentive Contracts

FPI contracts are complex and comprised of a target cost, target profit, target price, ceiling price, and a profit adjustment formula, which the Navy refers to as a sharing ratio, or a share line, which is used to determine

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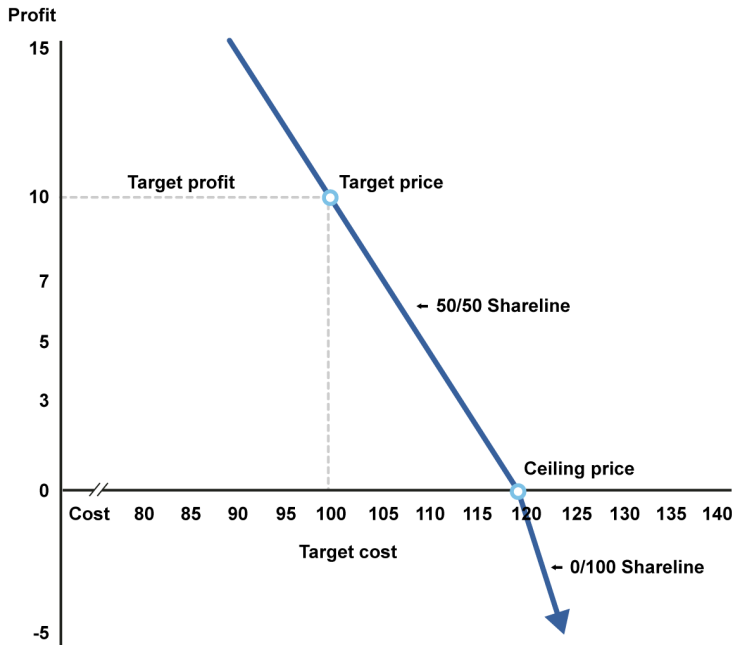
profit earned by the shipbuilder.<sup>7</sup> The target cost, schedule, terms and conditions, and the scope of work influence how the share line and ceiling price are established. The structure of the share line establishes how cost overruns (over target cost) and cost underruns (below target cost) are shared between the government and shipbuilder, and is used to calculate final profit earned by the shipbuilder. The ceiling price is the maximum the government can pay under the contract, except for adjustments under other clauses, and is expressed as a percentage of the target cost. The share line is intended to be the primary incentive for the shipbuilder to control costs.

The Navy uses various share line structures under FPI shipbuilding contracts. A commonly used share line utilizes the same share ratio between the shipbuilder and the government for both under target and over target performance. Figure 2 depicts a hypothetical example contract with a 50/50 share line above and below the target cost, with the ceiling price set at 120 percent of target cost. This means that the cost overrun or cost underrun savings would be shared equally between the Navy and shipbuilder. As shown in the figure, the ceiling price represents the government's maximum liability under the contract. The figure also details the elements of an FPI contract that are negotiated at the outset.

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<sup>7</sup>There are two types of fixed-price incentive contracts: fixed-price incentive (firm target) and fixed-price incentive (successive target). Fixed-price incentive (firm target) contracts are commonly used in Navy shipbuilding programs. In contrast, fixed-price incentive (successive target) contracts are rarely used in Navy shipbuilding programs. These contracts are used in situations involving procurement of the first or second production quantity of a newly developed item when cost or pricing information available at the time may not be adequate for the establishment of an fixed-price incentive (firm target) contract but when that information is expected at a point relatively early in performance of the contract. Our analysis did not include any fixed-price incentive (successive target) contracts. For purposes of this report, unless otherwise noted, when we refer to FPI contracts, we mean fixed-price incentive (firm target) contracts under the larger umbrella of fixed-price incentive type contracts.

**Figure 2: Hypothetical Example of a Basic Share Line for a Fixed-Price Incentive Contract**



#### Target cost

The contract value against which final actual costs are measured in order to determine the final contract price. It should represent the point in the range of probable cost outcomes, from the most optimistic cost estimate to the most pessimistic cost estimate, that is considered to be the "most likely" cost outcome and at which there is an equal probability of either a cost underrun or overrun.

#### Target profit

A reasonable profit for target cost at target performance, determined by using a structured approach on negotiated contract actions when cost or pricing data is obtained.

#### Target price

The sum of the target cost and target profit which provides the basis for funding the contract.

#### Ceiling price

The maximum dollar liability for the government under the contract.

#### Share line

The formula used to adjust earned profit based on the variance of the final negotiated cost (either increase or decrease) from the target cost to determine the final price. It represents the allocation of cost risk between the government and the shipbuilder. Expressed as a ratio that adds to 100, the first number is the government's share and the second number is the shipbuilder's.

Source: GAO analysis of Defense Acquisition University information. | GAO-17-211

In instances when cost risk apportionment is not equally shared between the shipbuilder and the Navy, a share line with different share ratios for under target and over target performance—such as an 80/20 underrun and a 70/30 overrun—can be used. In these scenarios, the Navy would receive 80 cents of every dollar of cost savings or conversely pay 70 cents of every dollar of cost overrun.

## DOD and Navy Guidance on FPI Contracts

In recent years, DOD has pushed for the increased use of FPI contracts in major defense acquisition programs, where appropriate. Guidance and regulations on the use of FPI contracts include:

- A series of Better Buying Power initiative memorandums, including a September 2010 memorandum in which DOD's Office of the Under

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Secretary of Defense for Acquisition, Technology, and Logistics (USD (AT&L)) encouraged the use of FPI contracts for acquisition programs in early production—this memorandum was followed by more detailed guidance that specified actions that USD (AT&L) expected to be executed. The September 2010, Better Buying Power initiative encouraged the use of FPI contracts, in part, because in the past DOD had awarded cost-plus-award-fee contracts with subjective award fees not clearly tied to cost control. A November 2010 memorandum stated the expectation that acquisition teams pay particular attention to share lines and ceiling prices, and that FPI contracts with a 50/50 share line and 120 percent ceiling price should be the norm, or starting point.<sup>8</sup> The Director of Defense Pricing stated that he believes DOD's increased use of FPI contracts, coupled with a more professional workforce that is more cost conscious, has saved billions of dollars and will ultimately result in savings far in excess of any other initiative associated with Better Buying Power.

- In response to DOD's Better Buying Power initiatives, the Office of the Secretary of Defense's Defense Procurement Acquisition Policy Office released guidance for using incentive contracts in April 2016.<sup>9</sup> This guidance stated that the use of FPI contracts by programs leads to better cost and schedule performance outcomes, and therefore suggested employing FPI contracts when appropriate—such as in a program's early production phase or near the end of engineering and manufacturing development.
- The Defense Federal Acquisition Regulation Supplement (DFARS), which has implemented the guidance set forth in the 2010 Better Buying Power initiatives, states that the contracting officer shall pay particular attention to share lines and ceiling prices for FPI contracts, with a 120 percent ceiling and a 50/50 share ratio, or sharing arrangement, as the point of departure for establishing the incentive arrangement.<sup>10</sup>

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<sup>8</sup>Office of the Under Secretary of Defense for Acquisition, Technology and Logistics Memorandum, Subject: *Better Buying Power: Guidance for Obtaining Greater Efficiency and Productivity in Defense Spending* (Washington, D.C.: Sept. 14, 2010) and Subject: *Implementation Directive for Better Buying Power – Obtaining Greater Efficiency and Productivity in Defense Spending* (Washington, D.C.: Nov. 3, 2010).

<sup>9</sup>Defense Procurement Acquisition Policy, Subject: *Guidance Using Incentive and Other Contract Types*, (Washington, D.C.: April 2016).

<sup>10</sup> DFARS 216.403-1(b) (3).

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- The Federal Acquisition Regulation (FAR) outlines the appropriate use of FPI contracts. The FAR states that an FPI contract should be considered appropriate when a firm-fixed-price contract is not suitable or the nature of the supplies or services being acquired and other circumstances of the acquisition are such that the contractor's assumption of a degree of cost responsibility will provide a positive profit incentive for effective cost control and performance. The FAR goes on to state that, if the contract also includes incentives on technical performance and/or delivery, the performance requirements should provide a reasonable opportunity for the incentives to have a meaningful impact on the contractor's management of the work. Further, the FAR specifies that FPI contracts are appropriate when the parties can negotiate at the outset a firm target cost, target profit, and profit adjustment formula that will provide a fair and reasonable incentive and a ceiling that provides for the contractor to assume an appropriate share of the risk. When the contractor assumes a considerable or major share of the cost responsibility under the adjustment formula, the target profit should reflect this responsibility.<sup>11</sup>
  - A series of memorandums released by the Assistant Secretary of the Navy for Research, Development and Acquisition between 2003 and 2010 stressed the importance of structuring incentive contracts in a way that best motivates the shipbuilder to meet requirements and protects the government's cost position.<sup>12</sup>

While DOD has recently promoted the use of FPI contracts through its Better Buying Power initiatives and changes to the DFARS, the Navy has used FPI contracts for shipbuilding programs for over 40 years. Specifically, FPI contracts have been the Navy's primary contract type since the mid-1970s, when the Navy shifted away from fixed-price sealed bid contracting—which began in 1963 at the recommendation of the Secretary of Defense. Moreover, during the 1980s, FPI contracts became the preferred contract type for detail design and construction of lead ships and follow-on ship construction, with many of the contracts using a 50/50 share line. According to DOD officials, FPI contracts fell out of fashion after the 1980s, with the Navy awarding more cost-type contracts

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<sup>11</sup>FAR 16.403-1(b).

<sup>12</sup>Assistant Secretary of the Navy Research, Development and Acquisition Memorandum, Subject: *Contracts Incentives, Profits and Fees* (Washington, D.C.: Oct. 28, 2003); Assistant Secretary of the Navy Research, Development and Acquisition Memorandum, Subject: *Contract Incentive Strategies* (Washington, D.C.: Nov. 2, 2005); Assistant Secretary of the Navy Research, Development and Acquisition Memorandum, Subject: *Aligning Department of the Navy Contracting Practices* (Washington, D.C.: June. 8, 2010).

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throughout the 1990s. Beginning in 2000, FPI contracts once again became the primary contracting method awarded for Navy ship construction for all but lead and early follow-on ships. We elaborate below on the picture over the past 10 years.

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## Differences between Navy and Commercial Shipbuilding

We have reported for many years on the long-standing problem of cost growth in shipbuilding programs. In our prior work examining numerous shipbuilding programs, we have found that cost growth was often attributed to the Navy awarding contracts to design and construct its ships before retiring technical risk.<sup>13</sup> Without a full understanding of the effort needed to deliver the ship, the government negotiated contracts where the Navy assumed all or a large percentage of risk, and was largely responsible for cost growth. In contrast, in our prior work when we examined commercial shipbuilding practices we found that ships are usually delivered on time, at cost, and with expected quality. Our prior work highlights differences in Navy and commercial shipbuilding contracting practices, which reflect differences in the two environments:

- In May 2009, we found: (1) for commercial shipbuilders and ship buyers, only firm-fixed-price contracts were used for design and construction activities, and the delivery date of the ship is clearly established in the contract with accompanying penalties for delays; (2) commercial buyers were able to choose from a competitive global base of available shipyards and suppliers without generally needing to consider the long-term health of any individual yard or supplier; and (3) buyers and shipbuilders both made acquisition decisions based on anticipated return on investment.<sup>14</sup>
- In November 2013, we reported that as opposed to commercial buyers, which typically operate in a robust, competitive environment, the Navy has a limited industrial base to build its ships. We noted that one result of the limited industrial base is that the Navy may award sole source contracts in order to sustain workloads and the solvency of the companies involved. This is because the Navy has fewer

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<sup>13</sup>Critical technologies often remain in development at detail design and construction contract award, which imposes greater technical risk to programs.

<sup>14</sup>[GAO-09-322](#).



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choices of shipbuilders and has an interest in sustaining these shipbuilders despite shortfalls in performance.<sup>15</sup>

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## The Navy Primarily Used FPI Contracts for Shipbuilding over the Past 10 Years in an Effort to Share Cost Risk While Sustaining the Industrial Base

From November 2005 to November 2015, the majority—19 of 23—of the Navy’s shipbuilding contracts were FPI, with contract obligations of \$66.5 billion. According to Navy contracting officials, FPI contracts can enable the Navy and the shipbuilder to share cost risk more equitably than other contract types. However, three of the six selected FPI contracts we reviewed lacked a key document describing the Navy’s rationale for selecting an FPI contract. In addition, business clearance memorandums—which document the basis for approval of the action and for determining that negotiated prices are fair and reasonable, provided varying levels of insight into the rationale for final contract terms. The Navy is awarding these complex FPI contracts in an environment with a limited industrial base and low volume of ship procurement. These factors constrain the Navy’s ability to award shipbuilding contracts competitively. While competition can better position the Navy to influence final contract terms, the Navy is, for the most part, the only customer for the major U.S. shipbuilders and therefore has a desire to sustain shipbuilders despite shortfalls in performance. Many factors—such as the degree of competition and the number of ships expected to be procured under a contract—are considered during contract negotiations to determine FPI contract terms. But the realities of the U.S. shipbuilding environment reduce the Navy’s leverage to negotiate favorable contract terms even when shipbuilder performance falters.

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## The Navy Primarily Used Fixed-Price Incentive Contracts for Shipbuilding over the Past 10 Years

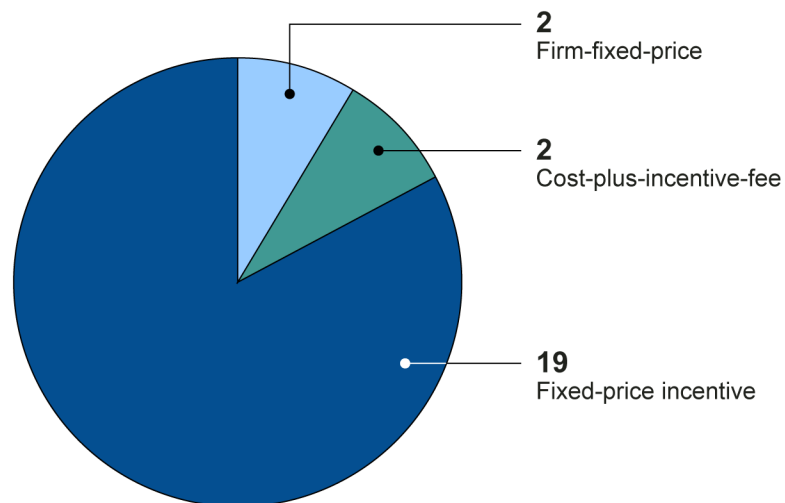
Between November 1, 2005, and November 30, 2015, the Navy awarded 23 detail design and construction contracts for Navy shipbuilding programs. Of the 23 contracts awarded in the 10-year time frame, 19 were FPI contracts as shown in figure 3.<sup>16</sup>

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<sup>15</sup> GAO, *Navy Shipbuilding: Opportunities Exist to Improve Practices Affecting Quality*, [GAO-14-122](#) (Washington, D.C.: Nov. 19, 2013).

<sup>16</sup> The two firm-fixed-price contracts that the Navy awarded for detail design and construction during the 10-year time frame were for single non-combatant ships.

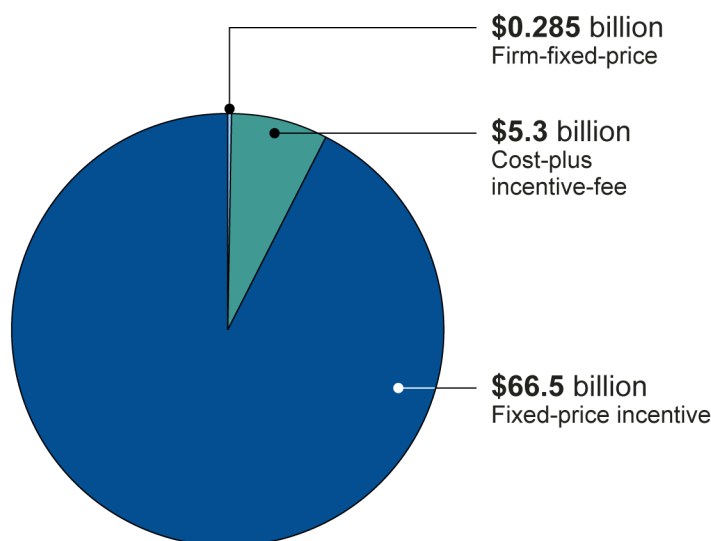
**Figure 3: Navy Shipbuilding Detail Design and Construction Contracts by Contract Type from November 2005 to November 2015**



Source: GAO analysis of Department of Defense data and Naval Vessel Register data. | GAO-17-211

A total of 83 individual ships were included under these 23 contracts, accounting for over \$72 billion in contract obligations. A majority of these ships, 79, were awarded on an FPI basis, representing \$66.5 billion in contract obligations, or over 92 percent of the Navy's total obligations for detail design and construction during the time frame, as shown in figure 4.

**Figure 4: Total Navy Shipbuilding Obligations for Detail Design and Construction Contracts from November 2005 to November 2015 (in billions)**



Source: GAO analysis of Department of Defense data. | GAO-17-211

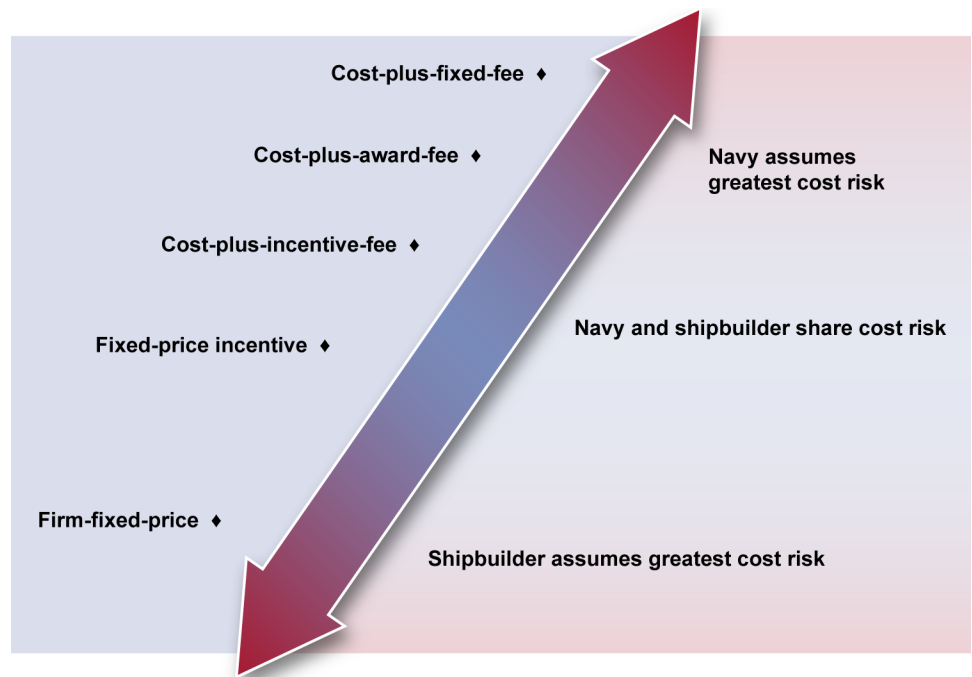
## The Navy Prefers FPI Contracts but Did Not Always Document Its Rationale for Determining Contract Type and Elements

According to Navy contracting officials, the Navy prefers FPI contracts for shipbuilding programs over other contract types because cost risk can be shared between the Navy and the shipbuilder more equitably. According to the Director of Defense Pricing, contractors are trained to include the price of all risks in their cost; therefore, FPI contracts can result in lower contract costs than firm-fixed-price contracts because if risks do not materialize under an FPI contract the government and the contractor share any cost savings. Under a cost-plus-incentive-fee contract, once costs exceed the target cost, the Navy continues to pay the allowable costs and the shipbuilder only earns the minimum fee (profit).<sup>17</sup> Under an FPI contract, the shipbuilder generally absorbs costs above the ceiling price. In contrast to both of these situations, under a firm-fixed-price contract the shipbuilder assumes full responsibility for all costs and the

<sup>17</sup>Cost-plus-incentive-fee contracts fall under the larger umbrella of cost-reimbursement type contracts. The Navy uses two other types of cost-reimbursement contracts for shipbuilding programs: cost-plus-fixed-fee and cost-plus-award-fee. A cost-plus-fixed-fee contract provides for payment to the contractor of a negotiated fee that is fixed at the inception of the contract. The fixed fee does not vary with actual cost, but may be adjusted as a result of changes in the work to be performed under the contract. A cost-plus-award-fee contract provides for a fee consisting of a base amount (which may be zero) fixed at inception of the contract, and an award amount, based upon a judgmental evaluation by the government, sufficient to provide motivation for excellence in contract performance.

resulting profit or loss. Navy contracting officials explained that the Navy rarely uses firm-fixed-price contracts for shipbuilding because it would likely result in higher offers. They noted that for ship construction, shipbuilders would likely factor in additional costs to account for their assumption of risk—particularly given the lack of competitive cost pressures due to the limited shipbuilding industrial base. Figure 5 identifies cost risk to the Navy and shipbuilder by contract type.

**Figure 5: Cost Risk to the Navy and Shipbuilder by Contract Type**



Source: GAO analysis of Defense Acquisition University data. | GAO-17-211

A required contract document that is intended to convey the rationale for selecting an FPI contract was not present in half of the six contract files we reviewed. Beginning in October 2009, the FAR required the government to complete a determination and findings document and include it in the contract file for all incentive- and award-fee contracts justifying that the use of this type of contract is in the best interest of the

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government.<sup>18</sup> Three of our six selected contract files, awarded after the interim FAR rule was published in October 2009, did not contain this required determination and findings document.

When we raised this issue, a senior Navy contracting official acknowledged that the NAVSEA Contracts Directorate had not been consistent in completing a determination and findings document for incentive-fee type contracts. Better documentation would help ensure that contract files reflect the rationale for why an FPI contract was determined to be the preferred contract type. From a business perspective, contracting officials who later revisit the file to make modifications or plan for future awards may not have a thorough understanding of why this contract type was selected. According to this same official, although the directorate had not been consistent in completing a determination and findings document for incentive-fee contracts, the general business process in place within the directorate, even prior to the FAR change, was to include discussion of contract type, including any applicable incentive fees, in the business clearance memorandum or acquisition planning documents.

Navy contracting officials told us that business clearance memorandums, specifically, are key documents for obtaining insight into decisions regarding FPI elements (e.g., target cost, share line, and ceiling price). These memorandums are generally required for each negotiated contract action by the Navy Marine Corps Acquisition Regulation Supplement, which states that the purpose of a pre-negotiation business clearance memorandum (completed prior to negotiations) and post-negotiation business clearance memorandum (completed prior to a settlement commitment) is to document the basis for approval of the action, and the basis for determination that the negotiated prices are fair and reasonable.<sup>19</sup> Additionally, the FAR requires the contracting officer to include this type of document in the contract file, and details specific requirements as to the content.<sup>20</sup> However, the business clearance

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<sup>18</sup>FAR 16.401(d). The interim FAR rule requiring a determination and finding document for all incentive- and award-fee contracts was effective as of October 14, 2009. 74 Fed.Reg 52856 (Oct. 14, 2009).

<sup>19</sup> Navy Marine Corps Acquisition Regulation Supplement 5201.690 and 5215.406-90. The pre- and post-negotiation business clearance memos together constitute the documentation required to be in a price negotiation memorandum by FAR 15.406-3 and DFARS 215.406-3, and should provide all of the information required therein.

<sup>20</sup> FAR 15.406-3.

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memorandums we reviewed provided varied levels of insight into decisions surrounding the rationale for final FPI contract terms. For example, the post-negotiation business clearance memorandum for the LPD 22-25 contract was relatively robust in its level of insight; it included a detailed rationale for the share lines, which were structured to reach agreement for two risks—shipbuilder’s property insurance and facility closure. Specifically, the post-negotiation business clearance memorandum provided detailed information on the nature of each risk, including a quantification of the potential cost impacts, to support the steps in the overrun share lines. In contrast, we found that:

- The SSN 784-791 contract, which was awarded on a sole source basis, did not have a post-negotiation business clearance memorandum in the contract file. According to a Navy contracting official, the post-negotiation business clearance memorandum was never completed because the staff responsible was reassigned to other higher priority work.
- The combined pre- and post-negotiation business clearance memorandum for the DDG 115 and DDG 116 noted that the contract includes a milestone-based incentive for each ship in order to motivate the shipbuilder on technical and management performance. However, while the memorandum provides a general statement on the purpose of the incentive, it did not explain the rationale for how the contracting officials determined the amount of the incentive or how it would possibly impact the target profit available on the contract. The contracting officials involved believed that the information in the business clearance memorandum was adequate.
- The post-negotiation business clearance memorandum for the two LCS block buy contracts did not include any information on the Navy’s rationale for selecting the share line and ceiling price for all 10 ships on each contract. These terms had been specified in the RFPs and were ultimately included in the contracts.

Without proper documentation for these complex contracts and the key decisions made about contract selection and FPI contract elements, the Navy does not position its contracting officials to clearly understand how decisions were made or to understand how to negotiate new contract terms in a way that would be most beneficial to the government. This is particularly important for the Navy going forward, as it intends to invest many billions of dollars in these same shipbuilding programs—in addition to others—over the next few decades.

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## While a Limited Shipbuilding Industrial Base Restricts the Navy's Bargaining Power, Competition Can Better Position the Navy to Influence Final Contract Terms

A limited number of U.S. shipbuilders and low volume of ship procurement limit the Navy's ability to award shipbuilding contracts competitively. Two companies—General Dynamics Corporation and Huntington Ingalls Industries—own five of the seven major U.S. shipyards that build Navy vessels. Further, several of these shipyards have specialized production capabilities that constrain and dictate the types of vessels each can build, and limit opportunities for competition within the shipbuilding sector. For instance, of the seven shipyards, only Newport News and Electric Boat have facilities for constructing nuclear submarines. We previously reported that this is in contrast to commercial ship buyers, who have an array of yards and suppliers to choose from.<sup>21</sup>

The desire to sustain workloads of the major U.S. shipyards is a key concern for the Navy, which also affects the Navy's ability to procure ships using full and open competition, because of the need to preserve the industrial base long-term for future shipbuilding programs. However, even in competitive procurements, the Navy's interest in maintaining the long-term health of U.S. shipbuilders can weaken its leverage at the negotiation table. This is because, unlike commercial buyers, the Navy and its shipbuilders largely operate in a symbiotic relationship, meaning that the Navy is, for the most part, the only customer and the major shipbuilders are the only providers of the desired product—the Navy ship. Of the seven major shipyards, only General Dynamics NASSCO regularly builds commercial ships alongside the Navy's. As a result, the Navy can be driven to sustain the shipbuilders for future programs despite shortfalls in performance.

The impact of the shipbuilding industrial base on the Navy's ability to drive a favorable business deal is particularly highlighted in a sole source environment. Two of the six contracts we reviewed were initially sole source awards.<sup>22</sup> In these cases, generally all contract terms—including contract type—were established through bilateral negotiations between the Navy and the shipbuilder. Therefore, once the Navy selects an FPI contract, the contract elements that are used to determine final contract price—including the share line and ceiling price—are subject to negotiations; the Navy cannot rely on competitive forces to strengthen its

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<sup>21</sup>[GAO-09-322](#).

<sup>22</sup>In the case of the ESD/ESB contract, the contract for system design with options for ship construction (lead ship and two follow-on ships) was awarded competitively; however, one of the two shipbuilders that bid withdrew its offer prior to contract award.

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negotiation position. The LPD 21 is an example of the reduced leverage the government has in a sole source environment. During negotiations for detail design and construction of LPD 21, the Navy agreed with the shipbuilder's request to change from an FPI/award-fee contract—as had been specified in the RFP—to a cost-plus-incentive-fee/award-fee contract.<sup>23</sup> Specifically, the shipbuilder informed the Navy that an FPI/award-fee contract would require it to offer an excessively conservative and unaffordable target cost. In light of this position, Navy contracting officials believed that a cost-plus-incentive/award-fee contract would be an acceptable solution. As a result, the program requested and received approval from the Assistant Secretary of the Navy for Research, Development, and Acquisition to proceed with cost-plus-incentive-fee/award-fee negotiations.

Even under the inherent constraints posed by the U.S. shipbuilding industrial base, competition can better position the Navy in negotiations than in a sole source environment. In a competitive RFP, for example, the contract type and other terms, including the share line and ceiling price, that the Navy specifies in its RFPs generally remain the same through negotiations and award in competitive acquisitions. Under this scenario, competition can help ensure that the shipbuilders put forth their best offer. For example, the Navy's RFP for DDG 114-116, which used limited competition between the two builders of the DDG 51-class destroyers, specified an FPI contract type, 50/50 share line, target profit, and ceiling price.<sup>24</sup> These contract terms remained consistent throughout negotiations.

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<sup>23</sup>LPD 21 is not included in our selected contracts; however, contract file information for the LPD ships included in our scope included information on the history of prior awards for ships in the same class.

<sup>24</sup>Two shipbuilders—General Dynamics Bath Iron Works and Huntington Ingalls Industries—build DDG-51 class destroyers. The Navy used a limited competition strategy for DDG 114-116 under which both shipbuilders submitted offers for construction of two ships, and the shipbuilder that offered the lowest total evaluated cost received a higher target profit percentage and its contract included an option for construction of DDG 116.



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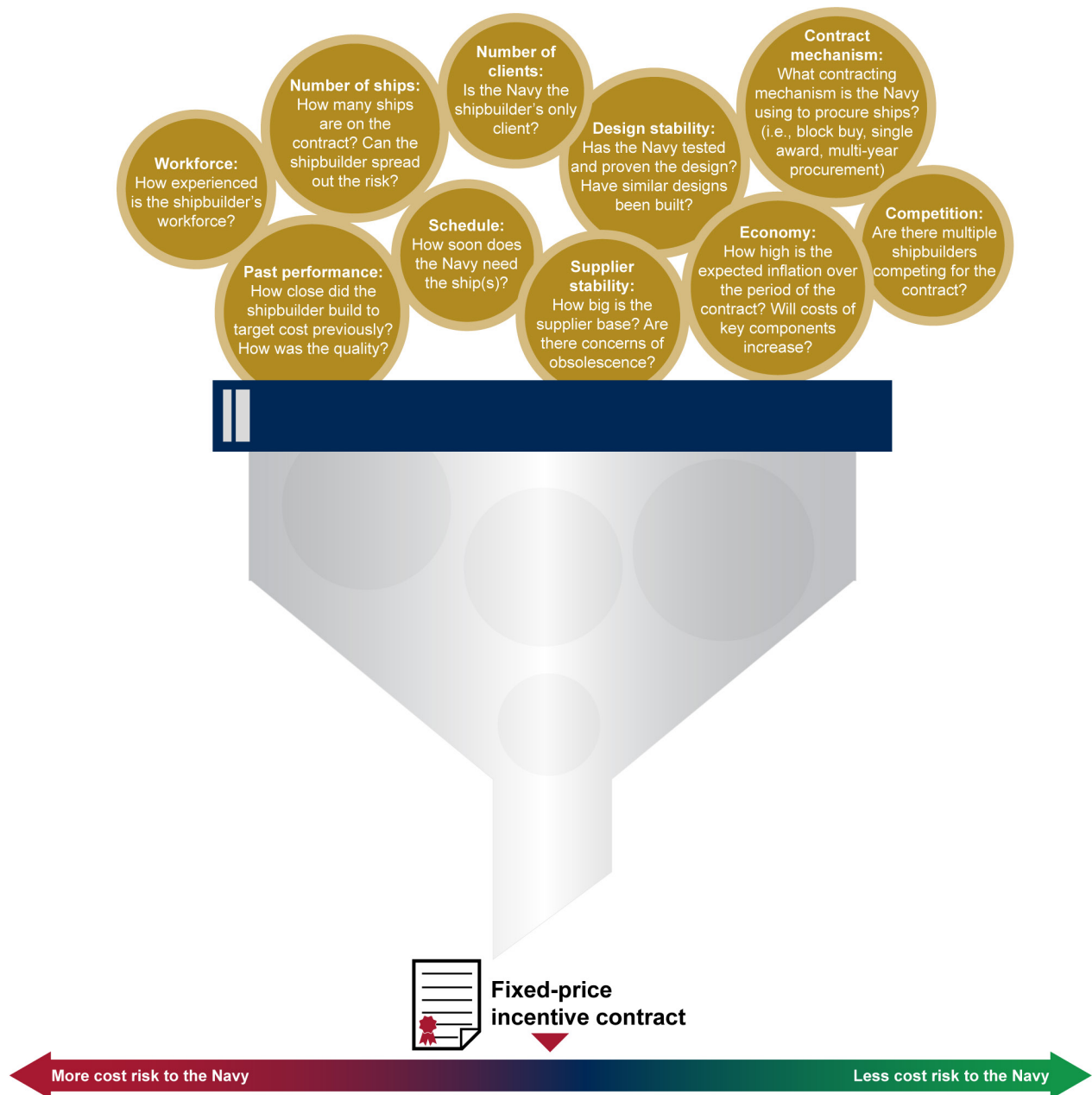
## The Navy and Shipbuilders Weigh Multiple Factors to Determine FPI Contract Elements

During our discussions with Navy contracting officials and shipbuilder representatives they emphasized that they consider multiple factors during contract negotiations to determine their negotiating positions regarding the various FPI contract elements. As shown in figure 6 below, how these factors are balanced in a contract ultimately determines the Navy's share of cost risk. Each contract is distinct with individual factors that are weighed differently depending on the unique circumstances of the acquisition. For example, if the contract is for a lead ship of a new class, the Navy and shipbuilder may weigh factors differently than if the contract is for a class where numerous ships have been delivered, since as we have reported previously, cost growth and schedule delays can be amplified for lead ships.<sup>25</sup> The factors range from broad considerations—such as degree of competition and the health of the industrial base—to considerations specific to individual shipbuilding programs, such as the number of ships expected to be procured under a contract.

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<sup>25</sup>[GAO-09-322](#).

**Figure 6: Factors Considered by the Navy and Shipbuilder in Determining Fixed-Price Incentive Contract Elements**



Source: GAO compilation of Navy and shipbuilder statements. | GAO-17-211

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Across the six selected contracts we reviewed, several factors shaped the structure of FPI contract elements. For example, one factor that shaped the structure of the FPI contract for the ESD/ESB program was that competition existed to build the ships, which enabled the Navy to issue a competitive RFP for system design with options for ship construction (lead ship and two follow-on ships) specifying an FPI contract type, share line, and ceiling price. Two shipbuilders submitted offers; however, one of the offerors withdrew and the contract was awarded to NASSCO. When the Navy exercised the options for ship construction, NASSCO representatives told us that NASSCO considered several factors in developing its proposal, including the use of a commercial ship design and the other workload NASSCO planned to have in the shipyard, which impacts overhead rates. In response to the shipbuilder agreeing to the Navy's contract terms, the Navy altered the underrun share line stated in the RFP and agreed to allow the shipbuilder to receive a greater share of the profit in the event actual costs were lower than expected.

An important factor in determining FPI contract elements for the Navy and shipbuilder is whether the contract will be a multi-year or block buy contract. These special contracting methods, which can only be used if Congress takes certain actions, allow DOD to acquire more than one year's requirements under a single contract award without having to exercise a contract option for each year after the first.<sup>26</sup> Three of the six contracts we reviewed were awarded as block buy or multi-year procurement contracts. In 2010, the Navy awarded a block buy contract for 10 ships to each of the two LCS shipbuilders, and the SSN 774 class contract was awarded in 2008 as a multi-year contract. These contract methods have the potential to create cost savings compared to a series of annual contracts because the shipbuilder is given an expectation of future workload, and allow for more economic procurement from suppliers and more efficient production which can translate into lower ship prices for the government. Under these contracting methods, the Navy and the shipbuilder typically negotiate prices for construction of all the ships on the contract at the same time, as well as the share line and ceiling price. Under such negotiations, the shipbuilder and Navy need to make

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<sup>26</sup>The FAR provides requirements for multi-year contracting, but it has no corresponding requirements for block buy contracting. Block buy contracting refers to special legislative authority that agencies seek on an acquisition-by-acquisition basis to purchase more than one year's worth of requirements. Both multi-year and block buy contracting differ from annual contracting, which refers to contracts that purchase up to one year's worth of requirements. Annual contracts are often multiple year contracts, which require the exercise of options to buy more than one year's requirements.

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assumptions regarding the shipbuilder's efficiencies, learning, and suppliers far into the future. For the three block buy or multi-year contracts we reviewed, we found that the share lines and ceiling prices did not change across the ships on each of these contracts, with target costs generally lower for ships procured later in the build profile, presumably to account for the shipbuilders' efficiencies and learning.

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## Structure of FPI Contract Elements Often Resulted in the Navy Absorbing More Cost Risk Than Guidance Advises, and Added Incentives Increased the Shipbuilders' Potential Profitability

Although FPI contracts are intended to motivate the shipbuilder to control costs by requiring the shipbuilder to assume a suitable share of the cost risk, the Navy often structured the FPI contracts we reviewed such that it shouldered more cost risk than guidance suggests as a starting point. While the guidance takes into account that each contract negotiation has its own unique aspects, we found a number of occasions where the Navy had departed from it, suggesting that the Navy may not be reaping the expected benefits of this contract type. Specifically, we found that: (1) for two of the six selected contracts, uncertainties at the time of contract award made establishing a realistic target cost challenging and (2) for most of the six contracts, share lines or ceiling prices were not in line with what guidance suggests as a point of departure. Further, the Navy included over \$700 million in additional incentives in the contracts—outside of the share line. These incentives had the potential to increase shipbuilder profitability and—in the event actual costs exceeded the ceiling—cushion the shipbuilders' losses. When the Navy assumes a greater share of cost overruns above the target cost, accepts a higher ceiling price, or both, the FPI elements may not provide sufficient motivation for the shipbuilders to control costs.

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## Structure of FPI Contract Elements Resulted in the Navy Absorbing a Greater Burden of Cost Risk Than the Shipbuilder in Most of Our Selected Contracts

FPI contracts can promote shipbuilder efficiency and reduce overall cost risk to the government when a firm-fixed-price contract is not appropriate. However, if the structure of the contract elements results in the government bearing too much of the cost risk, the effectiveness of FPI contracts in motivating the shipbuilder to control costs may be weakened. According to the Director of Defense Pricing, DOD's guidance has been to utilize FPI contract structures to align profitability with contract performance when there are well-founded cost expectations. As previously noted, DOD's Better Buying Power initiative also encourages use of FPI contracts, when appropriate, as a means to achieve better cost performance. We compared certain FPI contract elements in our sample to DOD and Navy regulations, guidance, and recommended practices for establishing target cost, share line, target profit, and ceiling price, and

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## Significant Cost Uncertainty Made Establishing a Realistic Target Cost Challenging in Two Cases

found that the Navy often ends up bearing more cost risk than these criteria support as a starting point.

Office of the Secretary of Defense and Navy officials, as well as the shipbuilding representatives we spoke with, agreed that contract negotiations often focus on the target cost, which according to a senior DOD official and guidance should be an achievable—but somewhat challenging—amount. According to April 2016 DOD guidance, the target cost should factor in the costs of known risks. Thus, to determine a target cost that reflects anticipated costs of performance, the Navy and shipbuilders need to evaluate and attempt to determine the cost of the full risk involved in constructing a ship. As we have previously found, the Navy has often proceeded to contract award with significant technical risk, unclear expectations between buyer and builder, and cost uncertainty.<sup>27</sup> This was in part because the Navy had not allocated sufficient time prior to contract award to retire technical risks. We found that in two of the six contracts we reviewed—the LPD 17 class and LCS ships—significant cost uncertainties made establishing a realistic target cost challenging. While various considerations need to be taken into account in negotiating target cost—and, in the case of LPD 17 class, Hurricane Katrina was an unusually disruptive factor—the Navy’s desire to sustain the industrial base, as discussed earlier, was a key driver.

- **LPD 22-25:** There was significant uncertainty at the time of contract negotiations for LPD 22-23. During the course of contract negotiations in summer 2005, the lead ship, LPD 17, was delivered incomplete at a cost of \$800 million more than planned. Then in August 2005, Hurricane Katrina caused major damage to the Gulf Coast area and the shipbuilder’s facilities, which resulted in the shipbuilder withdrawing all of its proposals until operations resumed. The Navy subsequently amended its solicitation to include options for two more ships (LPD 24 and LPD 25). The shipbuilder increased its proposed vessel labor hours for all 4 of the ships to account for increased use of inexperienced labor, out of sequence work, and additional rework, among other things, resulting from the hurricane. The contract was negotiated even though these were the first LPD 17 class ships beginning construction after Hurricane Katrina and there was still considerable risk surrounding the ships’ likely costs; the unique circumstances posed by the hurricane made it difficult to know whether the vessel labor hour increase would be representative of the

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<sup>27</sup> [GAO-09-322](#).

Navy and Shipbuilders Usually Shared Equally in Cost Overruns on the Share Line, but Navy Shouldered Additional Cost Risk by Setting Higher Ceiling Prices

actual impact on labor hours. In contrast, the Navy agreed to an increase in the target cost for LPD 26 when compared to LPD 25 because outcomes for LPD 22-25 were better understood at that time and because of unique schedule challenges with LPD 26. The business clearance memo for LPD 26 states that the Navy considered the target cost aggressive because it was considerably below the average estimates at completion for LPD 22-25.

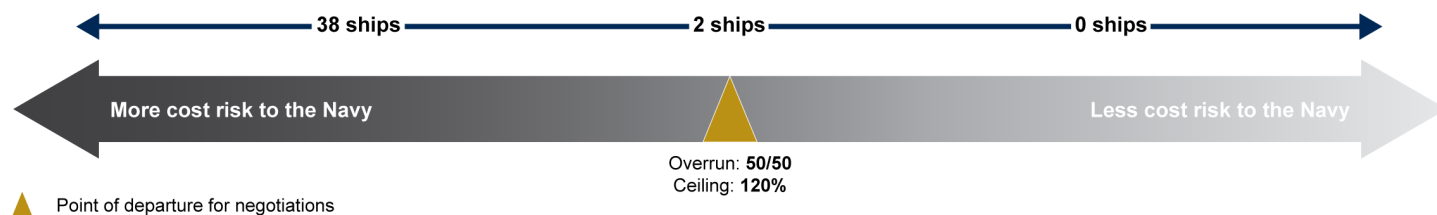
- **LCS 5-23 odd only and LCS 6-24 even only:** At the time the Navy awarded the two LCS contracts with options for up to 10 ships each, the shipbuilders had only delivered one ship each, both far exceeding the Navy's original contract value. Further, as we previously reported, these ships were delivered in an incomplete state and had outstanding technical issues. As a result, there was an incomplete understanding of the costs on which to base the target costs when the FPI contracts were awarded.<sup>28</sup>

In contrast, on the SSN 784-791 contract, the Navy had greater certainty about the shipbuilder's ability to achieve its cost targets because the shipbuilder had already delivered five ships at the time of contract award.

Another critical element of an FPI contract is how the burden of cost overruns or underruns is shared between the Navy and the shipbuilder, which is a function of the share line. The ceiling price, or the maximum amount the government will pay as part of the FPI structure (excluding other contract clauses), is also used to apportion risk between the Navy and shipbuilder. It is a combination of both the share line and ceiling price that determines the amount of cost risk placed on both the Navy and the shipbuilder. We found that, for the six shipbuilding contracts we reviewed, the share lines or ceiling prices, or both placed more cost risk on the Navy than guidance and regulation recommends as a starting point, as seen in figure 7.

<sup>28</sup>GAO, *Defense Acquisitions: Navy's Ability to Overcome Challenges Facing the Littoral Combat Ship Will Determine Eventual Capabilities*, [GAO-10-523](#) (Washington, D.C.: Aug. 31, 2010).

**Figure 7: GAO Assessment of Share of Cost Risk between the Navy and Shipbuilder for 40 Selected Ships at Time of Contract Award Compared to Guidance and Regulation**



Source: GAO analysis of Department of Defense data. | GAO-17-211

Note: The assessment of risk associated with ships is based on select contract elements and is not to scale. Both the overrun share line and the ceiling price were considered, with the ceiling price carrying more weight than the overrun share line because the cost implications of an increased ceiling to the Navy exceeded those of an increased share line burden. Ships assessed include Arleigh Burke Class Guided Missile Destroyers (DDG 115-116), Expeditionary Mobile Bases (ESB 3-4), Expeditionary Transfer Docks (ESD 1-2), Littoral Combat Ships (LCS 5-24), San Antonio Class Amphibious Transport Dock Ships (LPD 22-27), Virginia Class Submarines (SSN 784-791).

A memorandum issued by the Assistant Secretary of the Navy for Research, Development, and Acquisition in 2003 stated that Navy contracting officials should consider at least an equal sharing arrangement, or “50/50 share line” for most FPI contracts. This guidance also states that the contracting officer should use “aggressive” sharing arrangements, requiring the shipbuilder to share a substantial portion of both cost underruns and overruns whenever appropriate. The guidance also states that the Navy should consider cost sharing arrangements that increase the shipbuilder’s share if cost overruns increase, rather than sharing them equitably. For example, in many cases it may be appropriate to use a 50/50 share line for cost outcomes that are within plus or minus 5 percent of the target costs and 40/60 or 30/70 for other cost outcomes. In addition, since 2011, the DFARS has stated that the contracting officer shall pay particular attention to share lines with a 50/50 share ratio as the point of departure for establishing the incentive arrangement.<sup>29</sup> With the exception of two contracts, the selected contracts we reviewed used a share line with a 50/50 share ratio. The exceptions were (1) the LPD 22-25 contract, which had overrun share lines that varied depending on target cost performance and that held the Navy accountable on the share line for a greater degree of cost growth than the shipbuilder and (2) the SSN 784-791 contract, which had an overrun share ratio that held the shipbuilder accountable on the share line for a greater degree of cost growth than the Navy.

<sup>29</sup>DFARS 216.403-1.

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The ceiling price is also used to apportion risk between the Navy and shipbuilder. The ceiling price is often expressed as a percentage of the target cost; however, ceiling prices are dollar values, not percentages. Since 2011, the DFARS has stated that for FPI contracts contracting officers should consider a ceiling price of 120 percent of the target cost as a point of departure for establishing the incentive arrangement, meaning that the maximum the government could pay would be target cost, plus an additional 20 percent. DOD recently reiterated this point in April 2016 guidance. The Director of Defense Pricing stated that the actual ceiling price percentage to be used is a function of the perception of risk and who should bear that risk on any particular contract. He noted that in most instances, negotiated ceiling prices in contracts for major weapon systems other than shipbuilding, have been less than 120 percent.

In 38 of the 40 ships on the contracts we reviewed (the exceptions being ESD 1 and ESB 4), the Navy shouldered additional risk by setting higher ceiling prices than guidance suggests as a point of departure. In the case of the LPD 26 contract, the Navy agreed to a higher ceiling percentage than guidance suggests; the Navy believed this was appropriate given, among other things, the increased risk due to a gap in construction with the prior hulls and the shipbuilder assuming a greater degree of risk on the share line. Our analysis found that even an additional 5 percent above what the guidance recommends as a starting point can significantly increase the government's potential liability, particularly given the high value of shipbuilding contracts.

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### Majority of Contracts Included Additional Incentives That Provided the Potential for Shipbuilders to Earn Profit Outside of the Share Line

Although the cost incentive on the share line is intended to be the primary incentive for the shipbuilder to control costs, in 5 of the 6 contracts we selected for review, the Navy included additional incentives, which have the effect of increasing the shipbuilder's potential to earn profit or cushion its potential loss in the event of cost growth. These incentives, which totaled over \$700 million available to the shipbuilders, fell into four broad categories: award fee, cost incentives, milestone-based incentives, and shipyard investment incentives—added both at the time of award and post-award—that provided profit in addition to the target profit on the share line:

- Award fee: A shipbuilder may earn fee commensurate with overall cost, schedule, and technical performance as measured against



contractual requirements in accordance with the criteria stated in the award-fee plan.<sup>30</sup>

- Cost incentive (other than the share line): Only available to the shipbuilder if actual costs incurred meet a predetermined threshold.
- Milestone-based incentive: Encourages the shipbuilder to meet objectives that may or may not be tied to a date (e.g., achieving specified levels of ship completion at launch such as piping and cable installation, resolving shipbuilder responsible construction defects, or delivery on or before agreed upon delivery date, etc.).
- Shipyard investment incentive: Encourages the shipbuilder to make investments that reduce shipbuilding costs by improving construction, facilities, equipment, and processes.<sup>31</sup>

Only the ESD/ESB contract used the share line as its only incentive mechanism, as shown in table 1.

**Table 1: Additional Incentives Included in Six Selected Navy Shipbuilding Fixed-Price Incentive Contracts**

Program	Ships	Incentives (other than cost incentive on shareline)			
		Award fee	Cost (other than share line)	Milestone-based	Shipyard Investment
Arleigh Burke Class Guided Missile Destroyers (DDG 51)	DDG 115			X	X
	DDG 116				
Expeditionary Transfer Dock (ESD)/Expeditionary Mobile Base (ESB)	ESD 1-2				
	ESB 3-4				
Littoral Combat Ship (LCS)	LCS 5-23 (odd ships) <sup>a</sup>		X	X	
Littoral Combat Ship (LCS)	LCS 6-24 (even ships) <sup>a</sup>		X	X	

<sup>30</sup>All contracts providing for award fees must be supported by an award-fee plan that establishes the procedures for evaluating award fee and a board for conducting the evaluation. Among other things an award-fee plan details the procedures for implementing the award fee by establishing the methodology for evaluating the contractor's performance during each evaluation period.

<sup>31</sup>This special fee is available to the shipbuilder only if it agrees to make a Navy-approved shipyard investment. We previously reported that shipyard officials cited lack of competition and instability in Navy shipbuilding work as major reasons investments in the facilities and equipment needs to be incentivized. GAO, *Defense Acquisitions: Guidance Needed on Navy's Use of Investment Incentives at Private Shipyards*, [GAO-10-686](#) (Washington, D.C.: July 26, 2010).

Program	Ships	Incentives (other than cost incentive on shareline)			
		Award fee	Cost (other than share line)	Milestone-based	Shipyard Investment
San Antonio Class Amphibious Transport Dock (LPD 17)	LPD 22-25	X	X	X	
	LPD 26			X	
	LPD 27 <sup>b</sup>				
Virginia Class Submarine (SSN 774)	SSN 784-791		X	X	X

Source: GAO analysis of Navy contract file information. | GAO-17-211

Note: The table above includes incentives available at both the time of initial award and incentives added to the contract post-award as was the case with the DDG 51, LCS, and LPD 17 programs as discussed in this report.

<sup>a</sup>The LCS block buy contracts include milestone-based incentives for all ships excluding LCS 5 and LCS 6.

<sup>b</sup>LPD 22-27 were awarded on a single contract. The base contract includes detail design and construction of LPD 22 and LPD 23 with options for LPD 24 and LPD 25. The Navy later executed a contract modification to add construction of LPD 26 and LPD 27 to the base contract. As noted in the table above, additional incentives vary among ships on this contract.

Examples of the additional incentives added include:

- LPD 22-25:** The Navy added millions of dollars in milestone-based incentives post-award to encourage the shipbuilder to complete work more efficiently, by completing heavy industrial work (pipe installation, hot work, cable pull, etc.) on land as opposed to in the water. Contract file documentation states that the Navy's analysis of the shipbuilder's performance on prior hulls indicated that there was a 50 percent premium to complete heavy industrial work in the water; therefore, the milestone-based incentives were structured to incentivize higher levels of ship completion prior to launch.<sup>32</sup> However, maximizing construction work completed on land is an essential aspect of an

<sup>32</sup>The milestone-based incentives added post-award for LPD 22-25 were a condition of the April 2009 workload swap for DDG 1000 and DDG 51 construction between General Dynamics Bath Iron Works and Northrop Grumman Shipbuilding (later spun-off to form Huntington Ingalls Industries)—two shipbuilders who build Navy surface combatants. After the Navy made the decision to truncate the DDG 1000 program and restart the DDG 51 program, it entered into a workload swap with both builders to align construction responsibilities for fiscal year 2009 and prior DDG 1000 class ships and selected DDG 51 class ships between Bath Iron Works and Northrop Grumman Shipbuilding to ensure shipyard workload stability at both yards, and, among other factors, maintain two sources of supply for future Navy surface combatant shipbuilding programs.

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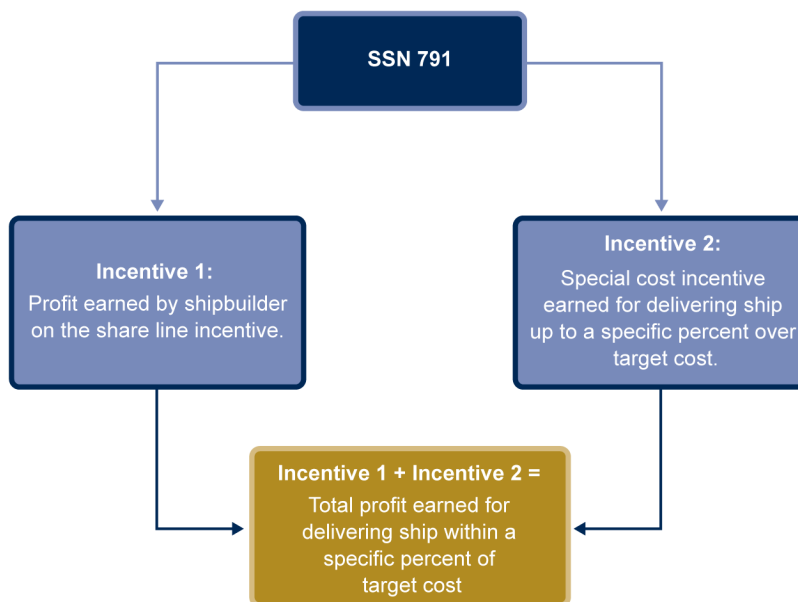
efficient build plan<sup>33</sup>—and, presumably, already incentivized through the profit that could be earned through the contract share line.

- **DDG 115 and DDG 116:** The Navy increased the shipyard investment incentive post-award. Contract file documentation states that the additional shipyard investment incentives were added as part of a comprehensive settlement agreement negotiated by the Navy and Bath Iron Works in July 2013 on ship construction efforts for the DDG 51 program.
- **LCS 5-23 odd only and LCS 6-24 even only:** The Navy added millions of dollars in milestone-based incentives to each LCS block buy contract post-award. According to a Navy contracting official, the rationale for adding these incentives was twofold: as consideration in exchange for the shipbuilders agreeing to fiscal year 2010 competitive pricing for the fiscal year 2016 ship that was added to each existing contract, and to motivate the shipbuilder to improve performance given poor cost and schedule outcomes on prior ships. These incentives did not apply to LCS 5 and LCS 6, the first ships on each contract.
- **SSN 784-791:** The Navy added additional incentives to encourage the shipbuilder to deliver the ships at or below an agreed upon percent of each ship's target cost. This created, in effect, a further incentive for the shipbuilder to minimize target cost overruns: (1) the share line for overruns provided an incentive for the shipbuilder to minimize costs to avoid losing profit, and (2) the additional cost incentive further elevated profit opportunity if the shipbuilder could deliver at a total cost that did not exceed the agreed upon percent of the target. Under this incentive structure, if the shipbuilder delivered at or below the agreed upon percent above target cost, then its share of an overrun cost would be largely or completely—depending on the amount of the overrun—covered by the additional cost incentive. In essence this means the Navy would cover any overruns up to the agreed upon percent. Figure 8 illustrates this duplicative incentive structure with a hypothetical example of SSN 791 coming in at the agreed upon percent over target cost.

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<sup>33</sup>Shipbuilders often describe a “1-3-8 rule,” where work that takes 1 hour to complete in a workshop takes 3 hours to complete once the steel panels have been welded into blocks, and 8 hours to complete after a block has been erected and/or after the ship has been “launched,” or conveyed from its building site to the water.

**Figure 8: Example of Potential Effect of Duplicative Cost Incentives for a Virginia Class Submarine (SSN 791)**



Source: GAO analysis of Navy contract file information. | GAO-17-211

The April 2016 DOD guidance stresses that the contractor should be primarily incentivized by receiving profit through the reduction of costs—a primary function of the share line, and in certain cases, by exceeding performance thresholds or reducing schedule. While program officials agreed that the share line should be a primary motivator on a contract, they noted that additional incentives could be used to encourage the shipbuilders to make targeted performance changes. Program and contracting officials stated that they must examine these issues on a program by program basis to determine whether an additional incentive is appropriate.

Fixed-Price Incentive Contracts Did Not Always Lead to Desired Outcomes, and the Navy Has Not Assessed Whether Additional Incentives Improved Shipbuilder Performance

Although FPI contracts are used to manage some degree of uncertainty (as compared with firm-fixed-price contracts), contract type alone cannot always ensure that desired outcomes are achieved. DOD guidance states that actual cost outcomes should approximate estimated costs within 2 to 4 percent before moving to a firm-fixed-price contract. We assessed actual costs for 11 delivered ships under the six selected contracts and found that the majority experienced cost growth above 4 percent, with six ships having significant cost growth of at least 15 percent. Due to the structure of the cost sharing arrangements, the Navy paid for the majority of the cost growth. Further as mentioned previously, for the ships we reviewed, the Navy added over \$700 million in additional incentives outside the share line. While these incentives reduced the shipbuilders' loss in some cases, the Navy has not undertaken an assessment of the effectiveness of these added incentives in terms of improved contract outcomes.

Costs Grew above Target on the Majority of FPI Contracts We Reviewed

Of the 11 ships on the contracts we reviewed that had been delivered to the Navy as of December 2015, 8 experienced cost growth, defined as actual costs exceeding the target cost. Six of the delivered ships had actual costs that were over 4 percent above target—with cost growth reaching as high as nearly 45 percent. Table 2 shows the actual cost outcomes for the 11 delivered ships.

Table 2: Cost Outcomes for Ships Delivered on Selected Navy Shipbuilding Contracts as of December 2015

Program	Delivered ship	Cost growth: percent difference between actual cost and target cost as of December 2015
Expeditionary Transfer Dock (ESD)/Expeditionary Mobile Base (ESB)	ESD 1	-4.19
	ESD 2	-8.43
	ESB 3	-13.27
Littoral Combat Ship (LCS) odd ships	LCS 5	<sup>a</sup>
Littoral Combat Ship (LCS) even ships	LCS 6	<sup>a</sup>
San Antonio Class Amphibious Transport Dock (LPD 17)	LPD 22	44.91
	LPD 23	35.94
	LPD 24	39.20
	LPD 25	27.26
Virginia Class Submarine (SSN 774)	SSN 784	2.08
	SSN 785	1.67

Source: GAO analysis of Navy data. | GAO-17-211

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Note: Cost growth may be due to Navy changes in contract scope, shipbuilder performance, or unanticipated events.

<sup>a</sup>DOD deemed the cost growth of the LCS 5 and LCS 6 to be sensitive but unclassified information, which is excluded from this public report. However, the percent difference for each ship was above target cost.

In addition to the ships that had been delivered, ships that had not yet been delivered as of December 2015 were also experiencing cost increases. For example, DDG 115 and 116, which had not yet been delivered as of December 2015, had incurred significant cost increases. On the ships not yet delivered on the LPD 17 class and LCS contracts, cost growth also has occurred.

While specific reasons for cost growth varied, unanticipated labor hour increases were a key factor identified by shipbuilding and Navy officials. In the case of LPD 22- 25, target costs may not have fully accounted for the lingering inefficiencies associated with recovery from Hurricane Katrina. Navy and shipbuilding officials cited increased labor hours associated with an inexperienced labor force and increased rework which impacted production schedules, along with increased costs due to outsourced work. Additional labor hours were also needed to implement a number of design changes starting on LPD 22 to address numerous defects found on delivered LPD 17 class ships. On the LCS and LPD 17 class contracts, both of which had ships that surpassed target cost, the government shared in at least 50 percent of the cost overrun up until costs reached a specified point, with the government's maximum liability capped at the ceiling price.

Cost increases above target have required the Navy to request additional funding from Congress, since ship construction budgets are generally funded to the target price. The LPD 17 class and LCS ships in our selected contracts have received a total of \$711.40 million between fiscal years 2007 and 2016 in additional funding above their original budgets which includes the government's portion of contract overruns. In addition to the funding that has already been received, the Navy is likely to have a continuing need for additional funding based on the cost growth identified for ships still under construction. The LPD 17 program accounted for \$551.77 million of the \$711.40 million over the past 10 years, including an additional \$45.10 million for the LPD 27 in the Navy's fiscal year 2017 budget request, primarily to cover the government's portion of the shipbuilding contract overrun.

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## The Navy Paid the Majority of the Cost Overruns for Delivered Ships on Selected Contracts

Our analysis also found that, for the ships delivered on the contracts in our review, the Navy paid over \$549 million in cost growth and the shipbuilder paid approximately \$430 million in cost growth. For the six ships that had been delivered as of December 2015 with significant cost growth (over 15 percent), we determined the government's and shipbuilder's share of cost overruns on the share line. Note that as costs increase above target price the shipbuilder's profit is reduced.

- The Navy's share of the cost growth for LPD 22-25 was hundreds of millions of dollars. The cost to deliver three of these ships far exceeded the ceiling price and the fourth ship came close to exceeding the ceiling price, despite the fact that the contract had some of the highest ceiling prices by percentage of all of the contracts we reviewed. The shipbuilder lost hundreds of millions of dollars in profit and had to absorb hundreds of millions of dollars in cost growth.
- For LCS 5 and LCS 6 the Navy was responsible for paying millions of dollars to address cost growth. Both ships were delivered over a year late and significantly overran target price, but did not exceed ceiling price. On LCS 5, the target cost was exceeded and the shipbuilder earned minimal profit. On LCS 6, the target cost was exceeded, the shipbuilder earned no profit, and incurred additional costs.

In contrast, the shipbuilders' cost performance on SSN 784-785 and ESD/ESB 1-3 resulted in better overall outcomes for the government and the shipbuilders. In the case of SSN 784 and SSN 785, the Navy and the shipbuilder paid a share of the cost overruns. The shipbuilder also earned hundreds of millions in profit on the ships. In the case of the ESD/ESB 1-3, the shipbuilder underran the target cost, resulting in the Navy saving millions of dollars (its share of the cost underrun). Further, all three ships were delivered on time or ahead of schedule. Ultimately, the shipbuilder's positive cost performance resulted in the shipbuilder earning hundreds of millions of dollars in profit including tens of millions from the share line incentive for underrunning its cost.

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## The Navy Has Not Assessed Whether Additional Incentives Helped to Achieve Desired Outcomes

For ships delivered under selected contracts, we analyzed the amounts that the shipbuilders ended up earning, including the over \$700 million in additional incentives that had been added to the contracts. We found that the Navy has paid over \$166 million in these additional incentives (beyond the incentive of the share line). However, it is unclear whether these incentives resulted in the outcomes that the Navy desired since, according to a senior Navy official, the Navy has not assessed the effectiveness of these incentives across its shipbuilding portfolio. Our

analysis indicates that for the 11 ships delivered in our case study contracts, cost and schedule outcomes were mixed, as shown in table 3.

**Table 3: Added Incentives Earned on Selected Contracts and Outcomes of Delivered Ships**

Program <sup>a</sup>	Ships	Additional incentives earned	Outcome
Expeditionary Transfer Dock (ESD)/Expeditionary Mobile Base (ESB)	ESD 1-2 ESB 3	N/A – no additional incentives	Ships delivered on time or early and under target cost
Littoral Combat Ship (LCS)	LCS 5	N/A – no additional incentives <sup>b</sup>	Ship delivered late and over target cost
Littoral Combat Ship (LCS)	LCS 6	N/A – no additional incentives <sup>b</sup>	Ship delivered late and over target cost
San Antonio Class Amphibious Transport Dock (LPD 17)	LPD 22-25	✓	Ships delivered late and over target cost
Virginia Class Submarine (SSN 774)	SSN 784 and 785	✓ <sup>c</sup>	Ships delivered early and within agreed to percentage above target cost

Source: GAO analysis of Navy data. | GAO-17-211

<sup>a</sup>The DDG 115 and 116 contract included additional incentives; however, neither ships were delivered as of December 2015.

<sup>b</sup>Additional incentives were added to both LCS contracts in our review. However, these incentives did not apply to LCS 5 and LCS 6.

<sup>c</sup>Additional incentives include shipyard investment incentives.

For example, in the case of the SSN 784 and 785, the shipbuilder received millions of dollars in additional incentives, a large portion of which were shipyard investment incentives, and the ships were delivered early and within the agreed upon percent of target cost. In contrast, for LPD 22-25, the shipbuilder received millions of dollars in additional incentives, but the ships were delivered 15 to 20 months behind their initial schedules and three of the four exceeded their ceiling prices.<sup>34</sup> While the shipbuilder did not earn a target profit for LPD 22-24, the additional incentives had the effect of reducing some of the shipbuilder's loss. Overall for these ships, the Navy paid more than what was expected, added extra incentives, and did not receive the ships on time or near the cost it originally expected.

<sup>34</sup>The shipbuilder earned milestone-based incentives for each ship. The Navy and the shipbuilder agreed to extend, via contract modification, the delivery incentive date specified in the contract at the time of award. The shipbuilder met the latest agreed upon delivery dates for these ships.



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On the DDG 115 and 116 contract, the shipbuilder was eligible to earn a milestone-based incentive on each ship. Despite being over target cost and behind schedule, the shipbuilder received a portion of the available incentive for each ship. This is, in part, because the milestone-based incentives are not tied to specific cost criteria; therefore, the shipbuilder is eligible to earn those incentives regardless of cost performance outcomes.

The FAR states that agencies should determine, on a regular basis, the effectiveness additional incentives have in improving contractor performance and achieving desired program outcomes.<sup>35</sup> This is to be done through the collection of relevant data on incentives paid to contractors and include performance measures to evaluate the data. The FAR goes on to state that this information should be considered as part of the acquisition planning process in determining the appropriate type of contract to be utilized for future acquisitions and that proven incentive strategies be shared among contracting and program management officials. Some contract files we reviewed included general statements on the rationale and perceived benefits to the government for individual incentives at contract award. However, according to a senior Navy contracting official, the Navy has never completed an analysis on the effectiveness of additional incentives on FPI contracts across its shipbuilding programs. Further, this official stated that such an analysis has not been on management's radar screen, even though the Navy has almost exclusively used FPI shipbuilding contracts for many years with the exception of the first few ships in a class. Without such analysis, the Navy cannot know whether or not these added incentives have achieved their desired outcomes across its shipbuilding portfolio. The Navy is also missing an opportunity to share information among its contracting and program officials about how incentives may or may not yield their intended benefits—particularly given the inherent complexities associated with the U.S. shipbuilding industrial base. The Navy plans to continue to invest billions of taxpayer dollars in procuring ships over the next 30 years—including more of the ships on our selected contracts as well as the Columbia Class Ballistic Missile Submarine (formally known as the Ohio Class Replacement, a \$95 billion program).<sup>36</sup> As a result, competition for funding among shipbuilding priorities will continue, and it is critical that the Navy has data on the effectiveness of additional

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<sup>35</sup>FAR 16.401(f)-(g).

<sup>36</sup>Estimated program cost in fiscal year 2015 dollars.

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incentives in improving performance and outcomes that can help inform future contract award decisions.

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## Conclusions

Navy shipbuilding is a long and complicated process, which, coupled with the symbiotic relationship between buyer and builder that characterizes the Navy shipbuilding environment, makes contracting decisions challenging. The Navy has relied heavily on FPI contracts for the last decade, but has not taken some actions that could help ensure the Navy is maximizing the effectiveness of these contracts. Given the looming funding needs of major shipbuilding programs—including more of the ships included in our case studies—there are opportunities to do so.

One way is to ensure that contracting officers document the rationale for using an FPI contract, and that the basis for FPI contract elements be clearly set forth in contract documents—in particular, determination and findings documents and the pre- and post-negotiation business clearance memorandums. Such documentation is required by regulation but we found that it had not been completed consistently for our selected contracts. From a business perspective, not having a record of these decisions could put future contracting officers and decision makers at a disadvantage when negotiating future contract awards or modifications.

A second way is to assess, on a shipbuilding-wide portfolio level, whether the additional incentives added outside of the FPI share lines are achieving desired outcomes and to gather insights from contracting and program officials who have experience with these incentives. We recognize that the additional incentives are but one of many factors the Navy must take into account as it negotiates with shipbuilders within the context of the U.S. industrial base. Nevertheless, for our selected contracts, the Navy had made over \$700 million available in additional incentives, but has not taken steps to understand whether this money is resulting in good outcomes for the government. Regulation, while not prescriptive, highlights the benefits of measuring the effectiveness of such incentives. Additionally, these actions make good business sense.

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## Recommendations for Executive Action

To help ensure the Navy thoroughly considers the relative benefits of using FPI contracts for shipbuilding versus other contract types, we recommend that the Secretary of Defense direct the Secretary of the Navy to take the following two actions.

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Issue a memorandum alerting contracting officials to ensure that they are following guidance laid out in the Navy Marine Corps Acquisition Regulation Supplement with regard to completing

- determination and findings documents that explain the rationale for using an FPI contract and
- pre- and post-negotiation business clearance memorandums, which clearly explain the rationale for FPI contracts' incentive fee structures (including the share line, ceiling price, and any additional incentives).

Conduct a portfolio-wide assessment of the Navy's use of additional incentives on FPI contracts across its shipbuilding programs. This assessment should include a mechanism to share proven incentive strategies for achieving intended cost, schedule, and quality outcomes among contracting and program office officials.

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## Agency Comments

We provided a draft of the sensitive but unclassified version of this report to DOD for review and comment.<sup>37</sup> In its written comments, reproduced in appendix II, DOD concurred with our recommendations and identified dates by which it plans to implement them. Specifically, the Navy plans to implement the recommendation related to issuing a memorandum regarding the completion of determination and findings documents that explain the rationale for using an FPI contract and pre- and post-negotiation business clearance memorandums which clearly explain the rationale for FPI contracts' incentive fee structures by March 31, 2017. The Navy also plans to complete the recommended portfolio-wide assessment of its use of additional incentives on FPI contracts across shipbuilding programs by December 15, 2017. DOD also provided technical comments, which we incorporated as appropriate.

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We are sending copies of this report to the appropriate congressional committees, the Secretary of Defense, and the Secretary of the Navy. In addition, the report is available on our website at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-4841 or [mackinm@gao.gov](mailto:mackinm@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on

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<sup>37</sup> GAO-17-219SU.

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the last page of this report. GAO staff who made key contributions to this report are listed in appendix III.

A handwritten signature in black ink that reads "Michele Mackin". The script is cursive and fluid, with the first name and last name clearly distinguishable.

Michele Mackin  
Director, Acquisition and Sourcing Management

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### *List of Committees*

The Honorable John McCain  
Chairman  
The Honorable Jack Reed  
Ranking Member  
Committee on Armed Services  
United States Senate

The Honorable Thad Cochran  
Chairman  
The Honorable Richard J. Durbin  
Ranking Member  
Subcommittee on Defense  
Committee on Appropriations  
United States Senate

The Honorable Mac Thornberry  
Chairman  
The Honorable Adam Smith  
Ranking Member  
Committee on Armed Services  
House of Representatives

The Honorable Kay Granger  
Chairwoman  
The Honorable Pete Visclosky  
Ranking Member  
Subcommittee on Defense  
Committee on Appropriations  
House of Representatives

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# Appendix I: Objectives, Scope, and Methodology

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The objectives of this review assessed: (1) the extent to which the Navy has entered into fixed-price incentive (FPI) contracts over the last 10 years and what influences the Navy's contracting approach when awarding FPI contracts for ship construction, (2) how the Navy apportions risk between the government and the shipbuilder for these contracts, and (3) the extent to which the FPI contract type led to desired outcomes.

This report is a public version of a sensitive but unclassified report that was issued on November 9, 2016.<sup>1</sup> DOD regarded some of the material in that report as sensitive but unclassified information, which must be protected from public disclosure and is available for official use only. As a result, this public version of the original report does not contain certain information deemed to be sensitive but unclassified by DOD, including specific ship lines, ceiling prices, and target costs of the Navy ships we assessed, our assessment of the share of cost risk between the Navy and shipbuilder on the 40 ships reviewed, specific dollar amounts of added incentives on ships we assessed, and Navy and shipbuilder cost outcomes on six delivered ships with significant cost growth. This report uses data from December 2015 to be consistent with the report issued in November 2016.

To determine the Navy's use of FPI contracts over the last 10 years, we compiled and analyzed Department of Defense (DOD) data on contracts awarded for detail design and construction of new ships from November 2005 through November 2015. To ensure the reliability DOD data, we compared it to data from DOD's Naval Vessel Registry to confirm the award date of each ship, and for all contracts awarded during our 10-year time frame, we reviewed the documentation available in DOD's Electronic Document Access System to verify contract number, award date, and contract type. As part of this process we determined that the data provided by DOD was sufficiently reliable for the purpose of this audit. Using this information, we identified the universe of Navy detail design and construction contracts awarded on an FPI basis during our 10-year time frame.

To identify factors that influence the Navy's contracting approach when awarding FPI contracts for ship construction and how the Navy apportions risk between the government and the shipbuilder for these contracts, we

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<sup>1</sup> GAO, *Navy Shipbuilding: Need to Document Rationale for the Use of Fixed-Price Incentive Contracts and Study Effectiveness of Added Incentives*, GAO-17-219SU (Washington, D.C.: Nov. 9, 2016).

reviewed a non-generalizable sample of six FPI contracts for the detail design and construction of five different shipbuilding programs using the following characteristics:

- contract award between November 1, 2005, and November 30, 2015;
- number of ships on the contract;
- at least one ship on the contract had previously been delivered or would be delivered imminently; and
- representative of the majority of U.S. shipyards that build Navy vessels, including Austal USA in Mobile, Alabama; General Dynamics Bath Iron Works in Bath, Maine; General Dynamics Electric Boat in Groton, Connecticut; General Dynamics NASSCO in San Diego, California; Huntington Ingalls Industries in Pascagoula, Mississippi; Marinette Marine Corporation in Marinette, Wisconsin.

As shown in table 4, the five shipbuilding programs executed under the six FPI contracts that met these criteria include 40 ships: one contract with two Arleigh Burke-class guided missile destroyers (DDG 51 class), one contract with two expeditionary transfer dock (ESD) and two expeditionary mobile base (ESB) ships,<sup>2</sup> two contracts each with 10 littoral combat ships (LCS),<sup>3</sup> one contract for six San Antonio-class amphibious transport dock ships (LPD 17 class), and one contract with eight Virginia-class submarines (SSN 774 class).

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<sup>2</sup>The ESD and ESB classes were originally called Mobile Landing Platform (MLP) and the MLP Afloat Forward Staging Base (AFSB) variant, respectively. In September 2015 the Secretary of the Navy redesignated these ships to conform to traditional three-letter ship designations. For purposes of this report we refer to the program as the ESD/ESB program.

<sup>3</sup>For the LCS contracts the Navy added a ship to each contract post-award through a contract modification for a total of 11 ships on each contract. The Navy exercised the options for construction of these ships after the cutoff date for our analysis, December 2015; therefore, the 11th ship on each contract is not in our scope.

**Table 4: Overview of Navy Shipbuilding Programs Associated with Contracts Reviewed**

Program	Ships reviewed	Shipbuilder	Location
Arleigh Burke Class Guided Missile Destroyers (DDG 51)	DDG 115-116	General Dynamics Bath Iron Works	Bath, Maine
Expeditionary Transfer Dock (ESD)	ESD 1-2	General Dynamics NASSCO	San Diego, California
Expeditionary Mobile Base (ESB)	ESB 3-4		
Littoral Combat Ship (LCS)	LCS 5-23 (odd numbers)	Marinette Marine Corporation (subcontractor to Lockheed Martin)	Marinette, Wisconsin
	LCS 6-24 (even numbers)	Austal USA	Mobile, Alabama
San Antonio Class Amphibious Transport Dock (LPD 17)	LPD 22-27	Huntington Ingalls Industries <sup>a</sup>	Pascagoula, Mississippi/Avondale, Louisiana
Virginia Class Submarine (SSN 774)	SSN 784-791	General Dynamics Electric Boat Corporation/Huntington Ingalls Industries (a subcontractor to Electric Boat Corporation)	Groton, Connecticut/Newport News, Virginia

Source: GAO analysis of Department of Defense information. | GAO-17-211

<sup>a</sup>Northrop Grumman previously owned the Ingalls shipyard in Pascagoula, Mississippi and the Avondale shipyard in New Orleans, Louisiana, the primary shipyards in which LPD 17 class ships were built. In 2011, Northrop Grumman completed a spin-off of its shipbuilding operations to form Huntington Ingalls Industries. Huntington Ingalls Industries closed shipbuilding operations at the Avondale shipyard in 2014.

For our six selected contracts, we reviewed contract file documentation including acquisition planning documents, requests for proposals (RFP), business clearance memorandums—key documents that explain the rationale for contract selection and structure of FPI contract elements including target cost, target profit, share line, and ceiling price, cost and schedule data, and program briefings, among other documents. To identify changes in FPI contract elements through contract modifications over the life of the contract, we compared information in the base contract at the time of initial award, including the target cost, share line, ceiling price, and incentives, to this same information in the conformed contract, or the most up-to-date contract as of December 2015, which reflects any changes made to the contract since initial award. Note that ceiling prices are often expressed as a percentage of the target cost in the contract documentation; however, ceiling prices by definition are dollar values, not percentages. Since target costs and ceiling prices can change through modifications to a contract, the ceiling price and target cost indicated in updated contract documentation may not equate to the previously established ceiling price percentage denoted in the same documentation. For consistency, we used the ceiling price percentage cited for each ship when available to complete our analysis of this contract element.



We also reviewed relevant guidance on contract selection and the use of FPI contracts including Federal Acquisition Regulation, DOD and Navy guidance on FPI contracts including the DOD and National Aeronautics and Space Administration Incentive Contracting Guide, and memorandum from DOD and Navy regarding the implementation of FPI contracts. We supplemented our review of contract file information by interviewing Navy program and contracting officials for each shipbuilding program associated with our selected contracts, senior contracting officials in the Naval Sea Systems Command (NAVSEA) Contracts Directorate, officials from the Navy's Supervisor of Shipbuilding, Conversion and Repair (SUPSHIP), officials from the Under Secretary of Defense (Acquisition, Technology and Logistics) Office for Defense Procurement and Acquisition Policy, and shipbuilding officials.

To determine the extent to which FPI contracts led to desired outcomes, we analyzed contract file information and cost data for ships delivered as of December 2015 on our selected contracts to identify the delta (cost overrun or underrun) between the target cost for each ship in the most up-to-date contract as of December 2015, to SUPSHIP's estimated construction cost of the ship at completion as of December 2015. SUPSHIP officials agreed that the estimated construction cost of the ship at completion is a reasonable estimate of ship construction cost at delivery. According to SUPSHIP officials, the actual final cost of the ship is determined when the contract is closed out which typically occurs several years after the ship has been delivered, and none of our six selected contracts had been closed out.

We then calculated the price paid by the Navy and shipbuilder profit or loss for ships delivered as of December 2015 in the following manner:

1. We calculated the delta between the target cost for each ship in the most up-to-date contract as of December 2015 and SUPSHIP's estimated construction cost of the ship at completion as of December 2015 to identify if the ship was in a cost overrun or underrun scenario.
2. Using the contract share lines, we calculated both the Navy and the shipbuilder's financial responsibility for the cost overrun, or conversely any cost savings.
3. We then calculated profit earned by the shipbuilder, if any, and added this amount to the total cost that the Navy was responsible for to determine price to the Navy (cost and profit earned on the share line) for detail design and construction of the ship.

4. To determine profit or loss for the shipbuilder, we calculated the difference between target profit and the shipbuilder's responsibility for the cost overrun, or conversely any cost savings.

We conducted this performance audit from September 2015 to March 2017 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives

# Appendix II: Comments from the Department of Defense

Subsequent to receiving DOD's letter commenting on the draft version of the sensitive but unclassified version of this report, we changed that report number to GAO-17-219SU.



ACQUISITION,  
TECHNOLOGY  
AND LOGISTICS

OFFICE OF THE UNDER SECRETARY OF DEFENSE  
3000 DEFENSE PENTAGON  
WASHINGTON, DC 20301-3000

OCT 31 2016

Ms. Michele Mackin  
Director, Acquisition and Sourcing Management  
U.S. Government Accountability Office  
441 G Street, N.W.  
Washington, DC 20548

Dear Ms. Mackin:

This is the Department of Defense (DoD) response to the Government Accountability Office (GAO) Draft Report, GAO-17-18, "NAVY SHIPBUILDING: Need to Document Rationale for the Use of Fixed-Price Incentive Contracts and Study Effectiveness of Added Incentives" dated September 28, 2016 (GAO Code 100227). Detailed comments on the report recommendations are enclosed.

Sincerely,

A handwritten signature in black ink, reading "Claire M. Grady", is positioned above the typed name.

Claire M. Grady  
Director, Defense Procurement  
and Acquisition Policy

Enclosure:  
As stated

**GAO DRAFT REPORT DATED SEPTEMBER 28, 2016  
GAO-17-18 (GAO CODE 100227)**

**“NAVY SHIPBUILDING: NEED TO DOCUMENT RATIONALE FOR THE USE OF  
FIXED-PRICE INCENTIVE CONTRACTS AND STUDY EFFECTIVENESS OF ADDED  
INCENTIVES”**

**DEPARTMENT OF DEFENSE COMMENTS  
TO THE GAO RECOMMENDATION**

**RECOMMENDATION 1:** To help ensure the Navy thoroughly considers the relative benefits using FPI contracts for shipbuilding versus other contract types, GAO recommends that the Secretary of Defense direct the Secretary of the Navy to issue a memorandum alerting contracting officials to ensure that they are following guidance laid out in the Navy and Marine Corps Acquisition Regulation Supplement with regard to completing

- a determination and findings document that explains the rationale for using an FPI contract and
- pre- and post-negotiation business clearance memoranda which clearly explain the rationale for FPI contracts’ incentive fee structures (including the share line, ceiling price, and any additional incentives).

**DoD RESPONSE:** Concur. The Navy will implement this recommendation by March, 31, 2017.

**RECOMMENDATION 2:** To help ensure the Navy thoroughly considers the relative benefits using FPI contracts for shipbuilding versus other contract types, GAO recommends that the Secretary of Defense direct the Secretary of the Navy to conduct a portfolio-wide assessment of the Navy’s use of additional incentives on FPI contracts across its shipbuilding programs. This assessment should include a mechanism to share proven incentive strategies for achieving intended cost, schedule, and quality outcomes among contracting and program office officials.

**DoD RESPONSE:** Concur. The Navy will accomplish this recommendation by December 15, 2017.

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# Appendix III: GAO Contact and Staff Acknowledgments

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## GAO Contact

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## Staff Acknowledgments

In addition to the contact name above, the following staff members made key contributions to this report: Diana Moldafsky (Assistant Director), Jennifer Echard, Nathan Foster, Laura Greifner, Julie Hadley, Kurt Gurka, Julia Kennon, Jean McSween, Roxanna Sun, Abby Volk, Alyssa Weir, and Andrea Yohe.

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